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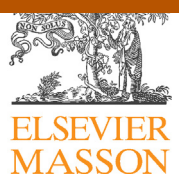

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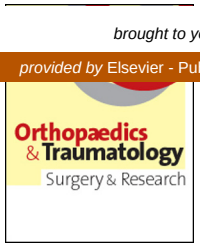

ORIGINAL ARTICLE

# Osteoporotic Fracture Program management: Who should be in charge? A comparative survey of knowledge in orthopaedic surgeons and internists

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**KEYWORDS**
Internist;
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Osteoporotic fracture;
Fragility fracture

**Summary**
*Background:* Osteoporosis has been described as a progressive skeletal disorder until a patient experiences a fragility fracture. The number of patients with osteoporotic fractures is increasing at an exponential rate. Orthopaedic surgeons, most of the time, first clinicians seen by patients at the time of fracture, do not routinely consider osteoporosis management. Therefore, we compared the knowledge of orthopaedic surgeons and internists regarding medical treatment required: which group would have more abilities to keep patients with osteoporotic fractures under management?
*Hypothesis:* We hypothesize that internists may have more abilities to assess and treat osteoporosis for patients with osteoporotic fractures; therefore, referring these patients to this specialized team for post-fracture medical consultation is required.
*Methods:* A questionnaire composed of seven closed questions was administered to 4700 orthopaedic surgeons and internists. This question list addressed the orthopaedic surgeons' and internists' knowledge in managing patients with osteoporotic fractures. The questions were designed in a way to cover the topics of diagnosis, treatment, and approach to an osteoporotic patient with osteoporotic fractures.
*Results:* In this survey, 3431 respondents were included. Only 118 (fewer than 10%) orthopaedic surgeons would order bone mineral densitometry (BMD) in osteoporotic fractures in contrast to 1544 (79%) internists. Approximately 1485 (76%) internists against 487 (33%) orthopaedic surgeons prescribe proper dosage of calcium and vitamin D.
*Conclusion:* Typical orthopaedic surgeon is not naturally inclined to manage patients with osteoporotic fractures. The existing management gap between the occurrence of an osteoporotic

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fracture and the identification and treatment of osteoporosis requires multifaceted intervention. Improved communication between orthopaedic surgeons and internists may reduce this gap between fracture occurrence and osteoporosis management.
*Level of evidence:* Level III prospective diagnostic study.


## Introduction

Osteoporosis has been described as a progressive skeletal disorder until an individual experiences an osteoporotic fracture, typically occurring at the wrist, vertebra or the hip [1]. In addition, osteoporotic fracture has been identified as the only clinically relevant marker of bone quality. These fractures typically occur when an individual experiences a low-energy trauma like falling from a standing height or less and even vertebral fractures often occur without a traumatic event [2]. According to previous studies, after the age of 40 years, a history of an osteoporotic fracture increases the risk of a secondary fracture by two- to nine-fold and can be a good predictor of a subsequent low-energy fracture [3,4]. The number of patients with osteoporotic fractures who are hospitalized is increasing at an exponential rate [5—7] thus in view of this critical health issue, it is necessary to question how we can ensure appropriate medical management of patients with these osteoporotic fractures.

Investigations have revealed inadequate osteoporosis evaluation and treatment following osteoporotic fractures [8—16]. A large retrospective cohort survey in the United States found that only 2.8% of women with osteoporotic fractures underwent densitometry and 22.9% were prescribed osteoporosis treatment [9]. It is now well established that management of osteoporosis is effective in preventing subsequent osteoporotic fractures in high-risk populations [16—27]. Also it has been shown that the timely initiation of treatment following an osteoporotic fracture can increase bone mineral density and lower fracture risk within months [28—33].

Among orthopaedic surgeons and internists worldwide, interest is growing in the investigation and treatment of osteoporosis in patients who have sustained an osteoporotic fracture. As orthopaedic surgeons are generally the first physicians to evaluate and treat patients with an osteoporotic fracture; therefore, it seems that they may have a unique opportunity to alter long-term health outcomes (i.e., the prevention of subsequent fracture) by referring the patient or by personally initiating identification and treatment of osteoporosis. Despite the increasing momentum in the academic orthopaedic surgeon community for orthopaedic surgeons to become more involved in general with facilitating medical treatment of their patients with an osteoporotic fracture, it is unclear how strongly orthopaedic surgeons consider treating these patients, whether they consider initiating medical management of patients with an osteoporotic fracture to be a necessary extension of their responsibilities [34]. Of surgeons who had ''extensive'' involvement in treating patients with osteoporotic fractures, 78% strongly agreed that expansion of their practice into non-surgical domains such as management of osteoporosis would be appropriate. However, previous surveys have demonstrated that the proportion of osteoporotic fracture patients who receive appropriate osteoporosis diagnosis and treatment is low [8—11,15,16,35—40] and orthopaedic surgeons still neglect to investigate, assess and treat such patients for osteoporosis. Similarly, Hajcsar et al. [36] in a cohort of 108 patients with a history of an osteoporosis fracture treated in an Ontario fracture clinic showed that less than 20% of patients were diagnosed with osteoporosis; fewer received appropriate therapy.

The aim of this survey was to compare the knowledge and ability of orthopaedic surgeons and internists in the management of osteoporosis in patients who experience an osteoporotic fracture. Our hypothesis was that many orthopaedic surgeons do not consider osteoporosis management to be inextricably linked to the surgical care of patients with an osteoporotic fracture. The present study was conducted in order to assess and compare the knowledge of orthopaedic surgeons and internists regarding the medical treatment of their patients with osteoporotic fractures, in order to find which groups have more abilities to keep on management of patients with osteoporotic fractures.

## Material and methods

### Material

The data-collection period for this study spanned from January 2010 to February 2011, and it continued until a sufficiently rich description of the concept under study was achieved. A survey composed of seven closed questions was administered by our research team to 4700 orthopaedic surgeons and internists. The invited orthopaedic surgeons and internists in the questionnaire group were chosen randomly from Pubmed database. This questionnaire had initially been pre-tested and validated before being used through our osteoporosis care team. The questions were designed in a way to cover the topics of diagnosis, treatment, and approach to an osteoporotic patient with an osteoporotic fracture. The content of the study was developed from a systematic literature review and the data were obtained from postal questionnaires with orthopaedic surgeons and internists. The form of the survey questions and responses were patterned in accordance with multiple-choice questions. The results were compiled 5 months after the first mailing. The reliability of the questions has been assessed by Cronbach's alpha; its values ranged from 0.72 to 0.91.

## Methods

Provided questions addressed the respondent's knowledge about osteoporotic fractures and underlying osteoporosis care as well as opinions regarding appropriate treatment interventions and related responsibilities. The mailing addresses of the surveyed clinicians were obtained from their articles published in Pubmed. The questionnaire was sent to orthopaedic surgeons and internists with a transmittal letter. No distinction was made regarding sex or whether a clinician was in an urban or rural area, in private practice, or at an academic center. The surveys were first mailed in April, and a second mailing, to the non-responders, was carried out one month later. Of the 4700 surveys that were sent, 2475 completed surveys (1004 orthopaedic surgeons and 1485 internists) were returned in the first communication (Table 1). The responders were offered no remuneration. To assess possible differences between the responders and non-responders, surveys were resent to the non-responders along with a transmittal letter from the principal investigator that stated the importance of the study and that completion of the survey was essential to ensure the statistical reliability

**Table 1** Number of orthopaedic surgeons and internists responded the respective questionnaire.

| | | Number of orthopaedic surgeons responded (%) | Number of internists responded (%) |
|---|---|---|---|
| USA | First Email | 17 | 19 |
| | Second Email | 11 | 9 |
| Canada | First Email | 7 | 8.5 |
| | Second Email | 3 | 7 |
| Brazil | First Email | 1 | 2 |
| | Second Email | 2 | 3 |
| Germany | First Email | 8 | 7.5 |
| | Second Email | 9 | 3 |
| France | First Email | 8.5 | 9.5 |
| | Second Email | 12 | 10 |
| Italy | First Email | 3.5 | 2 |
| | Second Email | 4.5 | 3.5 |
| Spain | First Email | 4 | 3.5 |
| | Second Email | 6 | 5 |
| Austria | First Email | 2 | 1.5 |
| | Second Email | 3 | 4.5 |
| Sweden | First Email | 3 | 3 |
| | Second Email | 2 | 6.5 |
| England | First Email | 4 | 6.5 |
| | Second Email | 10 | 8 |
| Portugal | First Email | 3.5 | 2 |
| | Second Email | 5 | 9 |
| Turkey | First Email | 1 | 0.5 |
| | Second Email | 0.5 | 0.5 |
| Belgium | First Email | 0.5 | 1 |
| | Second Email | 0.5 | 0.5 |
| Iran | First Email | 1.5 | 2 |
| | Second Email | 3 | 3 |
| China | First Email | 13.5 | 10.5 |
| | Second Email | 7 | 6 |
| Japan | First Email | 6 | 7 |
| | Second Email | 4 | 6 |
| South Korea | First Email | 5 | 4 |
| | Second Email | 2 | 3 |
| New Zealand | First Email | 1 | 1 |
| | Second Email | 3 | 2 |
| South Africa | First Email | 2 | 3 |
| | Second Email | 4 | 2 |
| Australia | First Email | 4.5 | 3 |
| | Second Email | 4 | 5 |
| Russia | First Email | 2.5 | 2 |
| | Second Email | 4 | 3 |
| Morocco | First Email | 1 | 1 |
| | Second Email | 0.5 | 0.5 |

of the study. Nine hundred and fifty-six additional surveys were obtained from the group of clinicians who had not responded to the previous mailings. Of the 4700 surveys that were sent, 3431 completed surveys were returned (a 73% response rate).

### Statistics

All statistical analyses were done using the SPSS software. The data were summarized using descriptive statistics (mean ± SD, number of patients per category, etc.). *t*-test and Chi-square were used to compare the data obtained.

## Results

Of the 2190 orthopaedic surgeons invited, 1477 orthopaedic surgeons (81% male and 19% female) averaging 43 years in age (range: 32—68 years old) and a mean of 14 years of experience (range: 5—27 years) were compared with 1954 internists (among 2510 internists invited) who responded (48% male and 52% female) and had a mean age of 41 years old (range: 32—69 years old) averaging 12 years of experience (range: 4—30 years). No significant difference was found between mean age and mean work years experience between the two groups ($P > 0.05$).

In this survey, only 15% of the orthopaedic surgeons and 25% of the internists agreed with high dose of vitamin D injection after stabilization in a patient with osteoporotic fractures. Although densitometry is reported as being accessible, in all departments, fewer than 10% of the orthopaedic surgeons in contrast to 79% of the internists would order bone mineral densitometry (BMD) in osteoporotic fractures. However, the knowledge in dosage of medications is different between orthopaedic surgeons and internists; although approximately 76% of the internists prescribe 1200 mg/kg calcium and 1000 IU/day vitamin D, orthopaedic surgeons believed in different dosages which are not indicated in previous studies; as the other result showed about bisphosphonate dosages in prevention (5 mg per day) and treatment (10 mg per day) [16]. If falling is supposed in a patient, 72% of the internists would refer to the respective team to manage falling. According to the questionnaire, if a patient presented with an osteoporotic fracture who is under corticosteroid therapy for a long time, 91% of the internists would order BMD compared with a much smaller percentage of the orthopaedic surgeons (8%). Approximately 14% of the orthopaedic surgeons and 83% of the internists felt knowledgeable in managing osteoporosis according to BMD interpretation as they refer well-known osteoporotic patients to internists as an orthopaedic surgeon and assess and treat secondary cause of osteoporosis as an internist (Table 2) (Fig. 1).

## Discussion

The present survey reflects the current status of orthopaedic surgeons and internists approaches to osteoporosis in patients with osteoporotic fractures. A study of two groups of 3431 orthopaedic surgeons (43%) and internists (57%) (1477 orthopaedic surgeons and 1954 internists among 2190 orthopaedic surgeons and 2510 internists responded the questionnaire, respectively) showed orthopaedic surgeons typically are not inclined in the management of osteoporosis in patients with osteoporotic fractures. Most of the orthopaedic surgeons displayed a general lack of motivation to refer these patients to the respective team for post-fracture medical consultation. In addition, the results of this study show that internists may have more abilities to assess and treat osteoporosis of patients with osteoporotic fractures, so by playing a major coordinating role an internist is able to ensure that the osteoporotic fracture patient receives appropriate non-surgical treatment and care in addition to the fracture management.

We note limitations to our study. First, endocrinologists and rheumatologists were not included. Second, in this survey we have selected orthopaedic surgeons and internists from the various health systems and organisations among the whole world. Although this variety in managing osteoporosis in different countries could be a limitation of this survey, it would not be a confounder to the conclusion. By the way, according to previous studies, under-management of osteoporosis is a big challenge in different health care systems.

Despite the evidence in support of detecting and treating patients for osteoporosis after they have sustained an osteoporotic fracture, only a small proportion of patients with osteoporotic fractures are receiving appropriate osteoporosis care [40], in addition up to 95% of patients are discharged without adequate determination of the cause of the fracture. Some published reports [9,11,15,16,35—38] demonstrate that the majority of patients with recent fractures have not been assessed for low BMD. According to the other study, barriers to osteoporosis care for osteoporosis fracture patients include time of identification and treatment, concerns about the effectiveness of treatments and lack of clarity about who is responsible for the initiation and management of these medications [34]. Obviously, in 2012, Sorbi and Aghamirsalim [41] reveal that the majority of orthopaedic surgeons responded lack of sufficient training in osteoporosis. This is reflected, subjectively and objectively, by inappropriate knowledge on osteoporosis management in most cases; therefore, it is easy to dismiss the underlying cause of osteoporotic fractures.

The polling results demonstrate that the orthopaedic surgeons representatives who participated have probably already positively selected themselves and consider that they are currently engaged or ready to engage in osteoporosis management for patients with osteoporotic fractures; therefore, the real lack of knowledge about osteoporosis is most likely underestimated as results indicated that internists are highly aware of osteoporosis care in osteoporotic fracture patients and largely positive about participation in care. In this context, it may be reasonable to promulgate an active role for orthopaedic surgeons in initiation of early management of osteoporosis. Such activity, without an appropriate referring or consulting with internists [25], could result in substantial complications; therefore, orthopaedic surgeons' awareness could improve the osteoporosis management rate in patients with osteoporotic fractures [21].

The main message of this study is that despite the availability of a number of therapeutic options, many patients

**Table 2** Results of the seven closed questions.

| | | Orthopaedic surgeons | | Internists | | *P*-value |
|---|---|---|---|---|---|---|
| | | Correct answer (%) | Wrong answer (%) | Correct answer (%) | Wrong answer (%) | |
| 1 | A 63-year-old woman with a family history of maternal hip fracture and complaint of subtrochantric fracture was presented. Patient was stable. Orthopaedic surgeon injected the patient with 50,000 IU vitamin D | 15 | 85 | 25 | 75 | 0.1 |
| 2 | A 65-year-old man with a hip fracture was candidate for operation treatment. The patient was operated successfully. What would you suggest in the next step? | 8 | 92 | 79 | 21 | < 0.05 |
| 3 | A 52-year-old woman with a wrist fracture was presented to your department. If you found out that she had had an osteoporotic, what dosage of calcium and vitamin D would you prescribe after surgery? | 33 | 67 | 76 | 24 | < 0.05 |
| 4 | In previous section, what dosage of Bisphosphonate would you prescribe for prevention and treatment of an osteoporotic fracture? | 25 | 75 | 67 | 33 | < 0.05 |
| 5 | A 73-year-old man with a previous vertebral fracture was presented to your office for follow-up. The mechanism of his fracture was falling. What would you suggest in the next step? | 29 | 71 | 72 | 28 | < 0.05 |
| 6 | A 54-year-old man (a known case of rheumatoid arthritis) has been prescribed prednisolone 5 mg per day for 6 months. He was presented with a fracture in his distal right radius. What would you suggest in the next step? | 8 | 92 | 91 | 9 | < 0.05 |
| 7 | A 74-year-old woman with a history of subtrochantric fracture was hospitalized. The BMD test revealed -3 and -5 as T-score and Z-score, respectively. What would you suggest in the next step? | 14 | 86 | 83 | 17 | < 0.05 |

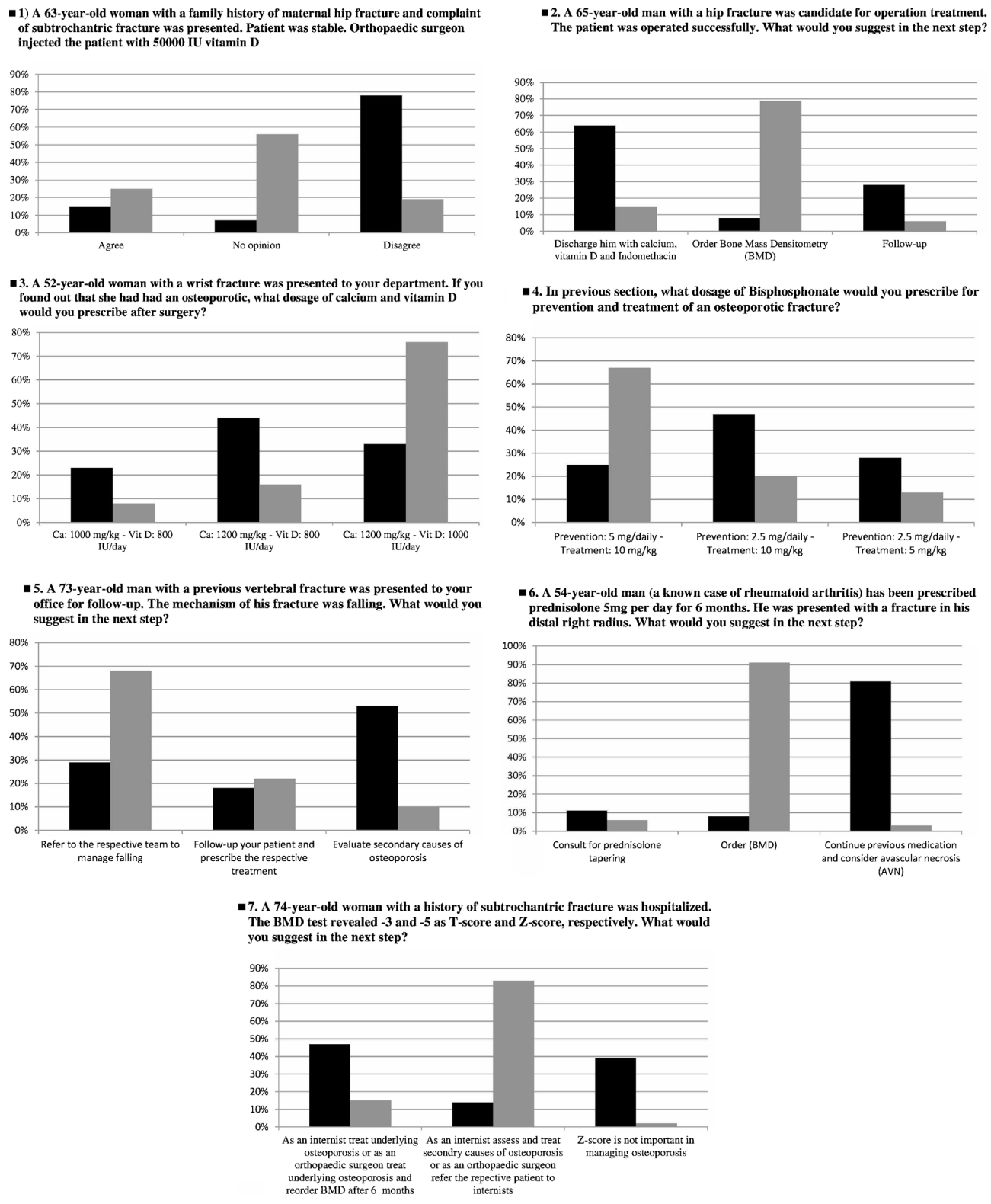


**Figure 1** Survey questions and respondents (black columns are percent of the orthopaedic surgeons' responses and gray columns are percent of the internists' responses).

with osteoporotic fractures do not undergo appropriate osteoporosis care, and are at high risk for subsequent fractures. The existing management gap between the occurrence of an osteoporotic fracture and the identification and treatment of osteoporosis requires multifaceted intervention in order to reduce the incidence of future fracture. Improved communication between orthopaedic surgeons and internists with respect to patient follow-up may reduce

the gap between fracture occurrence and osteoporosis management.

## Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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